PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Applicant's or agent's file reference P200018	Date of mailing *(day/month/year)* 20.09.2004
	IMPORTANT NOTIFICATION

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 02/07010	25.06.2002	25.06.2002

Applicant
BOREALIS TECHNOLOGY OY

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:	Authorized Officer
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Form PCT/IPEA/416 (January 2004)

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference P200018	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 02/07010	International filing date *(day/month/year)* 25.06.2002	Priority date *(day/month/year)* 25.06.2002

International Patent Classification (IPC) or both national classification and IPC
C08F210/16

Applicant
BOREALIS TECHNOLOGY OY

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
16.01.2004	20.09.2004

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 02/07010

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-14 as originally filed

Claims, Numbers

1-12 received on 13.08.2004 with letter of 13.08.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3,4,7,9
	No:	Claims	1,2,5,6,8,10-12
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-12
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Subject-matter

Subject-matter of the present application is a multistep polymerization process for the preparation of a polypropylene based polyolefin composition having improved scratch resistance.
In a first step, a propylene matrix is produced in a slurry reactor.
Then, in a second step, the slurry is transferred to a first gas phase reactor, wherein a mixture of ethylene and propylene is polymerized In the presence of the polymer matrix, then,
the product is transferred to a second gas phase reactor (a third step), wherein another mixture of ethylene and propylene is polymerized and the product is recovered.
The obtained product comprises a first ethylene /propylene copolymer having a higher molecular weight than the second ethylene/propylene copolymer.

2. Prior Art

D1 = EP 0 517 183 discloses a polymerization process, wherein propylene or mixtures of propylene with minor amounts of ethylene and/or higher α-olefins is prepolymerized in a slurry in a loop reactor. This slurry is further transferred to one or more gas phase reactors, wherein one or more olefins are polymerized to produce a rubber polymer.
In the examples, these one or more olefins are either ethylene and propylene, only ethylene or only propylene, but there is no example for propylene and ethylene.
Distinguishing feature from present claim 1 is that a specific disclosure for the production of a polymer product comprising two ethylene/propylene copolymers of a different composition and different molecular weight, produces in two gas phase reactors, is not present in D1.

D2 = EP 0 887 380 discloses a process for the preparation of propylene copolymers. In a slurry step, propylene is homo-. or copolymerized and in one or two following gas phase reaction steps, propylene and ethylene are copolymerized.
In example 2, a polymerization process, wherein propylene is homopolymerized in a slurry in a loop reactor. This slurry is further transferred to a gas phase reactor, wherein propylene is copolymerized with ethylene to produce a rubber polymer. The ethylene content of the product of the first gas phase reactor is controlled to be 2 % by weight,

while the ethylene content of the product of the second reactor is controlled to be 10 % by weight. The polymers are flashed according to D2.
Therefore, D2 is novelty destroying to present claims 1, 2, 5, 6, 8, 10, 11 and 12.
A distinguishing features from present claims 3 and 4 is, that the ethylene content disclosed in the most relevant example and in claims 13 and 15 of D2 is lower than required by present claims 3 and 4.

D3 = WO 98/59876 discloses a process for preparing propylene polymers.
In example 2 , a slurry polymerization of propylene is carried out in a loop reactor. The product is transferred to a first Gas phase reactor, hydrogen and propylene are added but no ethylene comonomer. In a second gas phase polymerization, ethylene is added as comonomer, too.
In example 11, propylene is polymerized together with a small amount of ethylene in a slurry in a loop reactor. This slurry is further transferred to a gas phase reactor, together with additional hydrogen and propylene but not ethylene. In a second gas phase reactor, an ethylene is also copolymerized.
In example 4, homopolypropylene is produced in a lop reactor. The obtained product is transferred to a first gas phase reactor together with additional propylene, ethylene and hydrogen. The product from the first gas phase reactor is transferred to a second gas phase reactor, wherein additional ethylene, propylene and hydrogen is fed.
However, a distinguishing feature from present claim 1 is that the product obtained from the first gas phase reactor has a lower molecular weight (higher melt flow rate) than the product from the second gas phase reactor (see also D3, page 15, lines 15 - 17).

D4 = WO 98/59002 discloses in examples 10, 12 and 13, (which are the closest examples) a polymerization process, wherein propylene is polymerized together with a small amount of ethylene in a slurry in a loop reactor. This slurry is further transferred to a first gas phase reactor, together with additional hydrogen and propylene.
In a second gas phase reactor, propylene is copolymerized with ethylene to produce an ethylene richer rubber polymer.
A distinguishing features from present claim 1 is that the first slurry product contains ethylene and no additional ethylene is fed to the first gas phase product .

D5 = WO 95/22565 discloses in example 3 a polymerization process, wherein propylene is (pre-)polymerized in a slurry in a loop reactor. This slurry is further transferred to three gas phase reactors comprising a second and a third steps, wherein ethylene and propylene are copolymerized. The ethylene/propylene ratio is slightly different and the second and in the third reactor.

A distinguishing features from present claim 1 is that the hydrogen concentration in the second reactor is slightly higher than in the third reactor, which will result in a slightly lower molecular weight of the first ethylene-propylene copolymer of D5.

3. Novelty (Article 33(2) PCT)

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claim 1, 2, 5, 6, 8 and 10 to 12** is not new in the sense of Article 33(2) PCT regarding **D2** for the reasons, outlined above.

4. Inventive Step (Article 33(3) PCT)

4.1. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 1, 2, 5, 6, 8 and 10 to 12** does not involve an inventive step in the sense of Article 33(3) PCT.
An inventive step can not be acknowledged to the claims which lack novelty.

4.2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 3 and 4** does not involve an inventive step in the sense of Article 33(3) PCT.
Example 2 of D2 is regarded as closest prior art for the subject-matter of present claims 3 and 4, as outlined in point 2, above.
The only distinguishing features from present claims 3 and 4 is, that the ethylene content disclosed in the most relevant example and in claims 13 and 15 of D2 is lower than required by present claims 3 and 4.
At present, there is no evidence on file that this difference alone would give rise to any technical effect.
Therefore, it was the objective technical problem to provide an alternative process in view of D2.
To solve this problem by modifying the comonomer content, however, appears an obvious measure for the skilled person.
Therefore, an inventive step can not be acknowledged to the subject-matter of present claims 3 and 4.

4.3. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 7 and 9** does not involve an inventive step in the sense of Article 33(3) PCT.
The addition of additives and/or fillers in general is an obvious measure for the skilled

person. Therefore, the subject-matter of claims 7 and 9 can not contribute an inventive step to the main claim.
Therefore, an inventive step can not be acknowledged to the subject-matter of present claims 7 and 9.

Since dependent claim 6 is not clear as explained under Item VII, below, neither novelty nor an inventive step can be acknowledged to present claim 6.

5. Industrial applicability (Article 33(4) PCT)

Since the production of heterophasic polypropylene compositions with improved scratch resistance is an important technical process, industrial applicability can be acknowledged.

6. Certain defects in the international application

Subject-matter of present claim 6, which is dependent from claim 1, is a process whereby the first and the second gas phase polymerization steps are carried out in the same reactor. However, point (iv) of claim 1 clearly says that the product from the first gas phase reactor is transferred into a second gas phase reactor. It appears obvious that the first and the second reactor are different.
Therefore, Claim 6 appears contradictory to claim 1, whereon it depends.

7. Certain observations on the international application

7.1. Applicants attention is drawn to the fact, that the independent product-by-process **claims 8 and 10** (and the claims depending thereon) will not be allowable.
Novelty can only be acknowledged to a product (obtainable by a process), if the product as such fulfills the requirements of novelty. The products, which are subject-matter of claims 8 and 10 are not characterized by technical features, which would render novelty to these products.
Moreover, it can not be excluded, that the claimed process would also be suitable to produce any product, which is state of the art.

7.2. The application does not meet the requirements of Article 6 PCT because

claim 10 is not clear.
The parameter dL, used in present claim 10 can not be understood from the wording of the claim.

International Patent Application PCT/EP02/07010
Borealis Technology Oy

New claims:

1. A process for the preparation of a polypropylene polymer composition with bimodal rubber, said process comprising the steps of:

i) feeding propylene to a at least one slurry reactor and producing a polypropylene polymer matrix in the presence of a polymerisation catalyst in said at least one slurry reactor,

ii) transferring the slurry reactor product into a gas phase reactor (GPR),

iii) feeding a first mixture of ethylene and propylene to said first gas phase reactor and producing a first ethylene/propylene-copolymer in the polymer matrix in the presence of a polymerisation catalyst in said first gas phase reactor,

iv) transferring the first gas phase reactor product into a second gas phase reactor, and

v) feeding a second mixture of ethylene and propylene to said second gas phase reactor and producing a second ethylene/propylene-copolymer in the polymer matrix in the presence of a polymerisation catalyst in said second gas phase reactor,

vi) recovering the polymer product produced in step v) for further processing,

said first and second ethylene/propylene mixtures having different composition ratios and wherein said first ethylene/propylene-copolymer has a higher molecular weight than said second ethylene/propylene-copolymer.

2. Process according to claim 1 wherein the composition ratios of said first and second ethylene/propylene mixtures are adjusted so that in the first gas phase reactor, a propylene rich EPR rubber is produced in the propylene polymer matrix, and in the second gas phase reactor, a ethylene rich EPR rubber is produced in the propylene polymer matrix.

3. Process according to any of claims 1 or 2, whereby the polymerisation conditions in the gas phase reactors are such that in one GPR reactor A, the gas phase polymerisation step is carried out by adding propylene and ethylene monomers where the resulting amount of C_2 in the EPR formed in gas phase reactor A is in the range from 39 - 74 mol%, preferably 53 - 65 mol% and that in the other GPR reactor B, the gas phase polymerisation step is carried out by adding propylene and ethylene monomers where the resulting amount of C_2 in the EPR formed in gas phase reactor B is in the range from 77 - 99,9 mol%, preferably 84 - 96 mol%.

4. Process according to claim 3, whereby in GPR reactor A, the molar H_2/C_2 ratio is in the range between 0,01 to 0,1, preferably 0,03 to 0,06 and most preferably 0,05 and in GPR reactor B, the molar H_2/C_2 ratio is in the range between 0,3 to 0,7, preferably 0,4 to 0,6 and most preferably 0,5.

5. Process according to any of the preceding claims, whereby the polymer products are flashed before transferring them to the next polymerisation step.

6. Process any of the preceding claims, whereby the first and second GPR polymerisation steps are carried out in the same gas phase reactor.

7. Process according to any of the preceding claims, whereby the polymer product obtained in step vi is further treated for compounding with additives and/or fillers.

8. Polymer product obtainable according to the process of any of the preceding claims.

9. Polymer product according to claim 8, further comprising at least one additive or filler selected from minerals, slip agent and processing agents.

10. Polymer product obtainable according to the process of any of the preceding claims and having a dL value of less than 4, preferably less than 2.

11. Use of the polymer of claims 8 to 10 for manufacturing moulded articles.

12. Moulded article, comprising the polymer of any of claims 8 to 10.